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EUROPEAN PATENT APPLICATION

⑬ Application number: 86108354.1

⑮ Int. Cl. 1: F 25 D 23/06

⑭ Date of filing: 19.06.86

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⑰ Applicant: GENERAL ELECTRIC COMPANY, 1 River Road, Schenectady New York 12305 (US)

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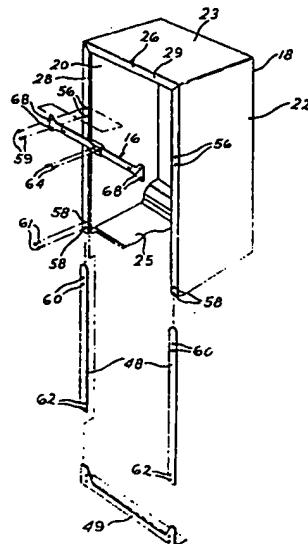
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⑯ Designated Contracting States: DE FR GB IT

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⑲ Refrigerator cabinet and method of assembly.

⑳ A refrigerator cabinet having an outer metal case including side walls and a top wall, a plastic inner liner and a partition separating a freezer and fresh food compartments and separate front door openings. A front face is formed along the front edge of the side walls and top wall defining the door openings. The front face along each side wall is provided with a first pair of vertically spaced openings arranged in the area adjacent the partition and a lower pair of vertically spaced openings arranged in the lower end of the front face. A support frame system is provided including vertically extending side support bars, each having pairs of vertically spaced upper and lower openings dimensioned to align with the upper and lower openings in the front face. An upper cross member extending between the side walls is positioned adjacent the front portion of the partition and a lower cross member extending between the lower edge portion of the side walls. The upper and lower cross members include a pair of vertically spaced openings adjacent each end thereof which are cooperatively arranged relative to the upper and lower pair of vertically spaced openings in the front face and support bar. Securing means cooperating with the aligned upper and lower pairs of vertically spaced openings in the front face, support bar and their respective cross members for securely holding the cross members substantially perpendicular relative to the cabinet side walls to thereby insure that the front door openings are maintained in a substantially square relationship.



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CROSS REFERENCE TO RELATED APPLICATIONS

1 This application is related to concurrently filed application
bearing applicants' docket designation 9D-HR-16454 Samuel J. Woolley and
Thomas E. Jenkins, and 9D-HR-16543 Thomas E. Jenkins and Robert R. Sisler,
each assigned to the General Electric Company, the assignee of the present
5 invention.

BACKGROUND OF THE INVENTION

10 In the construction of a household refrigerator it is often
desirable to provide a partition within the refrigerator for separating the
refrigerator into first and second compartments such as a freezer compart-
ment and a fresh food compartment. It is further desirable to have the
partition constructed in such a manner that there is a mullion across the
front of the partition and secured to the cabinet outer case to afford a
pleasing appearance. The freezer and fresh food compartments are in many
cases closed by separate access doors which are hingedly attached to the
15 cabinet outer case. For the pleasing appearance of the mullion and the
proper fit of the doors for the freezer and fresh food compartments it is
important that the width of the refrigerator cabinet be maintained and that
the loads on the door do not produce excessive deflection of the structure,
and further that the door openings are square and more importantly remain
20 square under normal or design loads.

25 Generally household refrigerators normally employ a sheet metal
outer casing and an inner liner with a resin foam insulation medium inter-
posed therebetween. The foam or polyurethane compositions in liquid/gas
form are introduced into the space between the outer casing and inner
liner, expand throughout the space and then are solidified by curing. In
practice this solid foam which inherently adheres to both the outer case
and inner liner adds a rigidity to the cabinet structure. This added
rigidity by the employment of foam insulation has enabled manufacturers to
reduce the thickness of the cabinet outer shell. In some instances the

1 cabinet will deflect due to uneven floors or the force placed on the cabinet by weight of the doors. This deflection can cause a misalignment of the door wherein proper closure of the cabinet is impossible. It has been determined that when a cabinet deflects due to its being positioned on an uneven floor or excessive door loading the foam insulation which adheres to both the outer case and liner creeps or distorts. When this occurs the foam insulation over a period of time will set in its distorted position thereby causing the cabinet deflected to form a permanent parallelogram as the cabinet conforms to the floor.

10 This problem is further present when the refrigerator door is dimensioned relative to the cabinet to carry relatively large items such as one gallon milk containers and other large items. These larger items may present a weight increase of 50% over customary doors, and when stored on the door shelves can exert a large force on the hinge side of the cabinet. 15 This force when excessive together with an uneven floor can cause the hinge side of the cabinet to sag and the cabinet frame to deflect and form a parallelogram. In this situation the door would be difficult to close and in some cases impossible.

20 Accordingly, by the present invention means are provided to insure that the cabinet door openings remain square under the forces applied by the weight of the doors on the cabinet frame and uneven floors.

SUMMARY OF THE INVENTION

25 By the present invention there is provided a refrigerator cabinet of the type having an outer metal shell with side walls interconnected by a top wall and a front face in which an inner liner and a partition separating a freezer and fresh food compartments is arranged. In carrying out the present invention the outer cabinet was constructed of pre-painted metal having a thickness of between .019 and .021. The front face is formed to include spaced first and second wall portions which are parallel to the front face. The front face and first wall portions are provided 30 with pairs of upper and lower vertically spaced aligned apertures.

1 Mounting brackets having upper and lower vertically spaced
apertures therein are arranged between the front face and the first
wall adjacent each side wall so that the apertures in the mounting
brackets align with the upper and lower aligned apertures in the front
5 face. An upper metal cross member having vertically spaced fastener
opening at each end thereof being spaced a distance such that they
communicate with the upper pair of vertically spaced aligned apertures,
and a lower metal cross member having vertically spaced fastener
openings at each end thereof being spaced a distance sufficient to
10 align with the lower pair of vertically spaced aligned apertures on the
front face of the outer shell. Securing means insertable through the
pairs of aligned apertures to secure the cross members perpendicular to
mounting brackets and the cabinet front face to thereby insure that the
side walls and cross members defining the front door openings are
15 maintained in a substantially square relationship.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a front elevational view of a refrigerator
incorporating the present invention;

Fig. 2 is a side elevational view of the refrigerator;

20 Fig. 3 is an exploded perspective view of the refrigerator
cabinet showing parts of the present invention prior to assembly;

Fig. 4 is a perspective view showing another embodiment of the
structure embodying the present invention.

25 Fig. 5 is a sectional plan view taken along line 5-5 of Fig. 1
showing the assembly of the present invention;

Fig. 6 is an enlarged front elevational view showing the hinge
area between the door of the cabinet;

Fig. 7 is a sectional plan view taken along line 7-7 of Fig.
6; and

30 Fig. 8 is an enlarged sectional plan view taken along line 8-8
of Fig. 1 in the lower portion of the cabinet.

DESCRIPTION OF THE PREFERRED EMBODIMENT

1 Referring to Figs. 1 and 2, a refrigerator 10 such as a top
mount household refrigerator, for example, one having a freezing
compartment 12 and a fresh food compartment 13 separated by an
insulation partition assembly 15. Positioned in front of the
5 insulation partition assembly 15 is a mullion component cross member 16
which, as will be explained fully hereinafter, insures the proper
orientation of the side walls and reduce deflection of structure due to
door loads of the cabinet. The partition assembly 15 and the manner in
which it is assembled to the cabinet is fully disclosed and described
10 in pending application for patent S.N. 622,257, filed June 19, 1984,
Arthur C. Wilson, assigned to General Electric Company, the assignee of
the present invention. The partition does not form a part of the
present invention and accordingly will not be described in detail
herein. Upon completion of the assembly of the refrigerator the
15 freezer compartment and fresh food compartments would have separate
doors 17 and 19 respectively for closing the respective compartments.
The refrigerator 10 (Fig. 3) has a cabinet outer metal case or shell 18
that has opposite side walls 20, 22, a top wall 23, and a bottom wall
25 which envelopes both the freezer and fresh food compartments. The
20 outer metal shell 18 has an interior liner 24 (Fig. 4) which is made of
sheet metal or plastic material. Between the inner liner 24 and outer
metal shell 18 (Fig. 4) there is insulation 27. This insulation in
many refrigerators consists of polyurethane foam which is in liquid
form and inserted or injected into the space between the outer metal
shell 18 and the interior liner 24 and then cured in place. During the
25 polyurethane foaming operation the outer metal shell 18 may bulge or
bow outwardly and thus cause some distortion of the side walls 20 and
22 of the outer metal shell 18. It is desirable that the bowing or

1 bulging of the outer shell when it occurs be corrected and eliminated
prior to the final assembly of the refrigerator so that the insulation
partition assembly 15 fits correctly relative to the side walls of the
liner 24 with no gaps between those components. Moreover, when the
5 doors 17 and 19 of the freezer compartment and fresh food compartment
are hung it is again important that the case dimensions from one side
20 to the other side 22 be the same throughout the height of the
refrigerator and that the door openings defining the freezer and fresh
food compartment remain square so that the doors align and seal the
10 front openings to the compartments 12 and 13 correctly.

With particular reference to Figs. 3-5, the components and
their arrangement involved with the method of assembling the
refrigerator cabinet will be discussed. Prior to the foaming operation
to provide the insulation between the outer metal shell 18 and interior
15 liner 24, the outer shell is formed to provide a front face 26. The
front face extends along both side walls and includes side wall
portions 28 interconnected by a top wall portion 29 against which the
doors of the freezer and fresh food compartments would engage and
seal. While the hinges 30 for the doors in the present embodiment are
20 shown mounted on the right hand side of the cabinet as viewed in Fig. 1
they may be mounted on either of the side wall portions 28. The outer
shell 18 in the present embodiment is fabricated from pre-painted metal
having a thickness generally between .019 and .021. This use of
relatively thin sheet metal in some instances requires that means be
25 incorporated in the cabinet construction which will insure against
cabinet deflection. The cabinet door openings defined by front face 26
partition 15 may distort out of square if one of the side portions of
the cabinet sags relative to the other. This relative vertical
movement of one side portion relative to the other results in the front

1 face forming a parallelogram. A side portion may sag for example when
forces are exerted on the cabinet when it is placed on an uneven floor
or when an excessive weight is placed on the door wherein the hinge
side of the cabinet will sag. This is especially true in cabinets
5 having relatively deep door shelves that are designed to hold heavy
items such as one gallon milk containers or the like. Formed relative
to the front face 26 of the cabinet and more particularly the side wall
portions is a flange 31 depending rearwardly from the front face 26
which has an S shape. The flange 31 includes a first reverse bend 32,
10 a second reverse bend 33, providing a first wall portion 36 and recess
38 between front face 26 and wall 36 and second wall portion 40 and
recess 42 between wall 36 and wall 40. Each of the walls 36 and 40
being substantially parallel to front face 26. A right angle bend 44
at the end of wall 36 provides a rearwardly extending wall 46. The
15 wall 46 is spaced from the side walls 20, 22 to allow the foam
insulation 27 to have access to that area of the outer case. Prior to
the foaming operation the liner 24 is arranged in the cabinet in spaced
relationship to the outer walls thereof with the peripheral edge 47 of
the interior liner 24 inserted into recess 42 as shown in Figs. 4 and 6.
20 In accordance with the present invention means are provided to
strengthen the cabinet relative to the front face and more particularly
the area defining the door openings. To this end, a support frame
(Fig. 3) is assembled to the front of the cabinet which includes the
upper cross member 16, a pair of vertical mounting brackets or bars 48
25 and a lower cross member 49.

The pair of mounting bars 48 which are a strong rigid metal
strip are, as shown in Figs. 4 and 5, located in the recess 38 between
the front face wall 26 and wall 36 of each side portion 28. The upper
and lower cross members 16 and 49 as will be explained fully

1 hereinafter are secured perpendicular relative to the mounting bars 48
and cabinet front face 26 in a manner which insures that they remain
perpendicular to the side portions 28 of cabinet front face 26. This
arrangement, as will be explained hereinafter, prevents deflection of
5 the cabinet and insures that the door openings remain square. With
reference to Fig. 3, it will be seen that the side front wall portions
28 are provided with upper and lower pairs of vertically spaced
openings 56 and 58 respectively which are aligned with cooperating
openings in the first wall 36. The mounting bars 48 are formed with
10 vertically spaced pairs of upper and lower openings 60 and 62 which are
spaced to align with openings 56 and 58 respectively when the bars are
positioned in the recess 38 as shown in Figs. 4 and 5. The bars 48 as
will be explained below add considerable strength to the area where the
mullion strip 16 and lower member 49 are connected to the side walls
15 20, 22 of the cabinet. Mullion component 16 and one of the mounting
bars 48 as shown in Fig. 5 are used to mount the door hinges 30
arranged between the upper and lower doors. As thus far described the
refrigerator cabinet with the mounting bars arranged with openings 60
and 62 aligned with openings 56 and 58 respectively is then processed
20 through the insulation foaming operation. The bars 48 are dimensioned
to take up the full width of the recess 38 so as to thereby prevent
foam insulation from passing through openings 56, 58 as the foam
expands into the area between wall 46 and side walls 20 and 22.

As mentioned above as a result of the foaming operation and
25 its expansion through the area between the cabinet outer walls and the
inner liner the cabinet may tend to bulge. That is, the side face
walls 28 may deviate or bulge from their intended paralleled position
and accordingly present a problem in properly fitting doors and other
components necessary to complete the refrigerator. Further, the doors

1 in the illustrative embodiment are relatively deep and are dimensioned
to accommodate large items and accordingly it may be possible for the
doors to be loaded so they will carry a considerable amount of weight
and accordingly cause the cabinet side frame to sag. The sagging of
5 the cabinet side wall under influence of door weight can cause the
cabinet to distort from a square or rectangle to a parallelogram. It
should be noted that the foam insulation generally adheres to both the
inner liner and cabinet, accordingly if the cabinet deflects due to an
uneven floor or excessive loading, the foam insulation will creep and
10 distort. After a period of time the insulation will set in the
distorted position causing the cabinet to permanently set in its
deflected or distorted position.

To this end means are provided by the present invention to
insure that the cabinet front face remain rectangular and that its side
15 walls are positioned and maintained at the correct cabinet width with
the door openings square. The mullion component 16 in the present
embodiment as shown in Fig. 2 is two piece member joined at the
center. The two piece arrangement facilitates the insertion of the end
portion of component 16 into the recess 42 as shown in Figs. 4 and 6.
20 Once the end portions are positioned in the recess 42 the two pieces
are then secured by fastening means 64 so the component 16 is
maintained at its predetermined proper length. With component 16 fixed
at its proper length the vertically spaced threaded openings 68 located
25 adjacent each end are aligned with the vertically spaced apertures 56
so that the cabinet will be at its correct width. Mounting bar 48 at
this point in time has been foamed into the cabinet with its vertically
spaced pair of openings 60 and 62 aligned with the vertically spaced
pair of openings 56 and 58 respectively. The component 16 is secured
by threaded fasteners 59 which pass through openings 56 in wall 28 and

1 openings 60 in mounting bar 48 to engage threaded openings 68 in
component 16. As shown in the drawings the mounting bar 48 and wall
portions 28 and 36 are sandwiched between the cross member 16 and
fastener 59. This arrangement including the vertically spaced pair of
5 openings secures the component 16 so that it will not pivot and remain
perpendicular relative to the side wall of the cabinet under forces
which may be applied thereto.

10 With reference to the door hinge bracket 30, it will be seen
that the bracket 30 includes vertically spaced aperture 61 which align
with the aperture in the cabinet side wall portion 28, 36, the aperture
in cross member 16 and the aperture bar 48. Accordingly, as shown in
Fig. 7 the door hinge bracket 30 is secured to the cabinet through the
frame system of the present invention.

15 The lower cross member 49, as shown in Fig. 7, is secured to
the outer surface of wall 28. The ends of the member 49 are provided
with vertically threaded spaced openings 70 (Fig. 3) which align with
openings 58 in the cabinet front, side wall 28 and opening 62 in the
lower end of the bars 48. The lower cross member 49 is at this time
secured to the cabinet by threaded fastening elements 61 which, like
20 the action of fastener 59 described above, pass through openings 58 in
cabinet wall 28 and openings 62 in mounting bar 48 to engage threaded
openings 70 of member 49. As shown in the drawings the mounting bar 48
and wall portions 28 and 36 are sandwiched between the cross member 16
and fastener 61. This arrangement effectively secures the cross member
25 49 relative to the mounting bars 48 and wall portion 28 of the front
face together in a manner which prevents pivoting of the member 49
relative to the cabinet side walls. By vertically spacing each
cooperating pairs of apertures 56,58 of cabinet wall 28, 60,62 of
mounting bars 48 and 68,70 of cross members 16 and 49 respectively as

1 described above, pivoting action of either the mullion component 16 or
cross member 49 relative to the cabinet front face is prevented. As
long as members 16 and 49 remain perpendicular to the side walls the
cabinet will not deflect. Means are further provided to insure that
5 movement between the fastening element 61 and the apertures it passes
through is minimized.

Referring to Figs. 4 and 6, it will be seen that the area
adjacent the openings 68 in member 16 and openings 70 in member 49 are
formed with a projecting chamfer 74. As the fastening elements 59 and
10 61 respectively are tightened the chamfer 74 is drawn and indexed into
a recess 76 formed in the area adjacent the openings 60 and 62 in bars
48. This indexing action afforded by the chamfer 74 and recess 76
locks the components against pivoting action to thereby prevent cabinet
deflection.

15 As best seen in Figs. 5 and 6 the mounting bars 48 are
employed to mount the central hinge 30 to the cabinet. In this
instance the fasteners 59 pass through openings in the hinge plate so
that they are secured to the cabinet through the frame system of the
present invention.

20 In certain cabinet configurations depending on the distance
between the cross member and cabinet top wall, it may be advantageous
to provide corner brackets 80 as shown in Fig. 3 to further insure the
integrity of the cabinet. In still further configurations depending on
cabinet size and the thickness of the steel used in fabricating the
25 outer case, it may be appropriate to extend the support bars as shown
in Fig. 4 to the upper corner where they may be secured to the brackets
80. In this instance both the freezer compartment 12 and fresh food
compartment would in effect be provided with a strengthening frame.

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PATENT - 9D-HR-16542-Jenkins et al

1 It should be apparent to those skilled in the art that the
embodiment described heretofore is considered to be the presently
preferred form of this invention. In accordance with the Patent
Statutes, changes may be made in the disclosed apparatus and the manner
5 in which it is used without actually departing from the true spirit and
scope of this invention.

What is claimed is:

1. A method of assembling a refrigerator cabinet of the type having an outer metal shell with side walls and a front face, an inner liner and a partition separating a freezer and fresh food compartments comprising:
 - 5 forming said front face to include spaced first and second wall portions parallel to said front face;
 - providing a first pair of vertically spaced aligned apertures in said front face and said first wall portion adjacent said partition;
 - 10 providing a second pair of vertically spaced aligned apertures in said front face adjacent the lower portion of said cabinet;
 - forming a first metal cross member having fastener openings at each end thereof spaced vertically apart a distance such that when said fastener openings are aligned with said aligned apertures said outer metal shell will have the correct cabinet width;
 - 15 forming a second metal cross member having fastener openings at each end thereof dimensional to align with said aperture in the lower portion of said cabinet;
 - inserting a support bar having a pair of vertically spaced apertures therein between said front face and said first wall adjacent each side wall such that the aperture in said support bars communicate with said aligned apertures in said first wall portion and said front face; and
 - 20 securing said first and second cross members to said front face adjacent said partition and said lower portion of said cabinet respectively by drawing said cross member, support bar, first wall portion and front face together to form a locked joint whereby said cabinet side walls and said cross members are maintained in a substantially square relationship.

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PATENT - 9D-HR-16542-Jerkins et al

1 2. The method of assembling a refrigerator cabinet as
recited in Claim 1 further providing a second pair of vertically spaced
aligned apertures in said front face and said first wall portion at a
location adjacent the lower end of said cabinet; and

5 forming a lower cross member having fastener openings at
each end thereof spaced vertically apart a distance so as to align with
said second pair of vertically aligned apertures.

1 3. The method of assembling a refrigerator cabinet as
recited in Claim 2 further forming a projecting chamfer adjacent the
vertically spaced pair of fastener openings in one of said cross
members; and

5 forming a recess adjacent said pair of vertically spaced
operation in said support bar for receiving said chamfer.

1 4. The method of assembling a refrigerator cabinet as
recited in claim 3 further including the step of providing a corner
bracket secured in each of the upper front corners of said cabinet,
said corner bracket including a leg portion arranged adjacent said side
5 wall portions of said cabinet.

1 5. The method of assembling a refrigerator cabinet as
recited in claim 4 further including the steps of providing elongated
mounting brackets which extend upwardly to engage said corner brackets;
and;

5 securing said leg portion of said elongated brackets to
said corner brackets to thereby provide a frame surrounding both of
said freezer and fresh food compartments.

1 6. A refrigerator cabinet of the type having an outer metal shell with side walls and a front face, an inner liner and a partition separating a freezer and fresh food compartments;

5 said front face including inwardly extending parallel side wall portions connected by a top wall portion;

 said side wall portions each being bent upon itself to provide a first wall portion forming a first recess between said side wall portion and said first wall portion and a second wall portion forming a second recess between said first and second wall portion;

10 said side wall portions and said first wall portion having a first vertically spaced pair of aligned apertures generally located in the area of said partition, and a second pair of vertically spaced aligned apertures arranged in the lower end of said side wall portions and said first wall portions;

15 a frame structure including an elongated mounting bracket arranged vertically in said first recess between each of said side wall portions and said first wall, including a pair of vertically spaced openings at each end communicating with said pairs of vertically spaced aligned apertures in said side wall portions and said first wall portion of said front face;

20 a first cross member having end portions arranged in said second recess including a pair of fastener openings in each end portion spaced vertically apart a distance such that when aligned with said first vertically spaced pair of said aligned apertures said outer metal shell will have the correct cabinet width;

25 a second cross member extending between said side wall portions including vertically spaced pair of fastener openings in each end thereof spaced to align with said second pair of vertically spaced aligned apertures;

1 securing means insertable through said vertically spaced
apertures for drawing said cross member and elongated mounting brackets
relative to said first and second wall portions for securely holding
said cross members substantially perpendicular to said side walls to
5 thereby insure that said door openings are maintained in a
substantially square relationship.

1 7. The refrigerator cabinet as recited in Claim 6 wherein a
chamfer is formed adjacent the fastener openings in one of said cross
members and a recess adjacent the openings in said mounting bracket for
receiving said chamfer.

1 8. The refrigerator cabinet recited in claim 7 wherein a
corner bracket is secured in each of the upper front corners of said
cabinet, said corner brackets including a leg portion arranged adjacent
said side wall portion of said cabinet.

1 9. The refrigerator cabinet recited in claim 8 wherein said
elongated mounting brackets extend upwardly to engage said corner
brackets, means securing said leg portion of said corner brackets to
said elongated brackets thereby provide a frame surrounding both of
5 said freezer and fresh food compartments.

FIG. 1

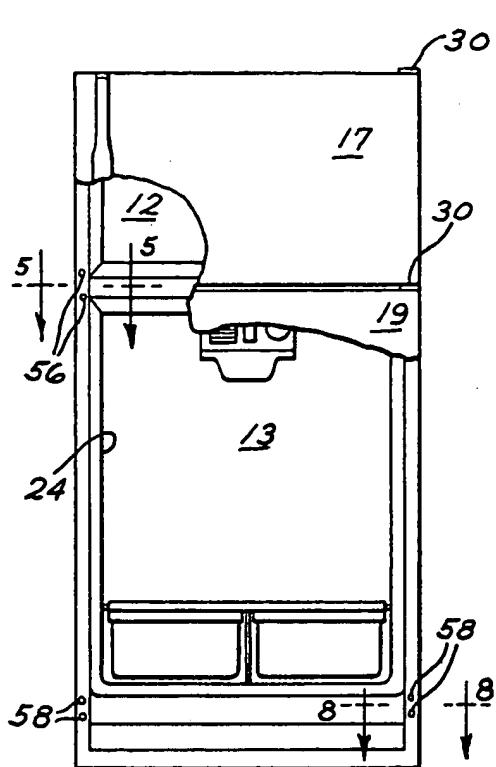


FIG. 2

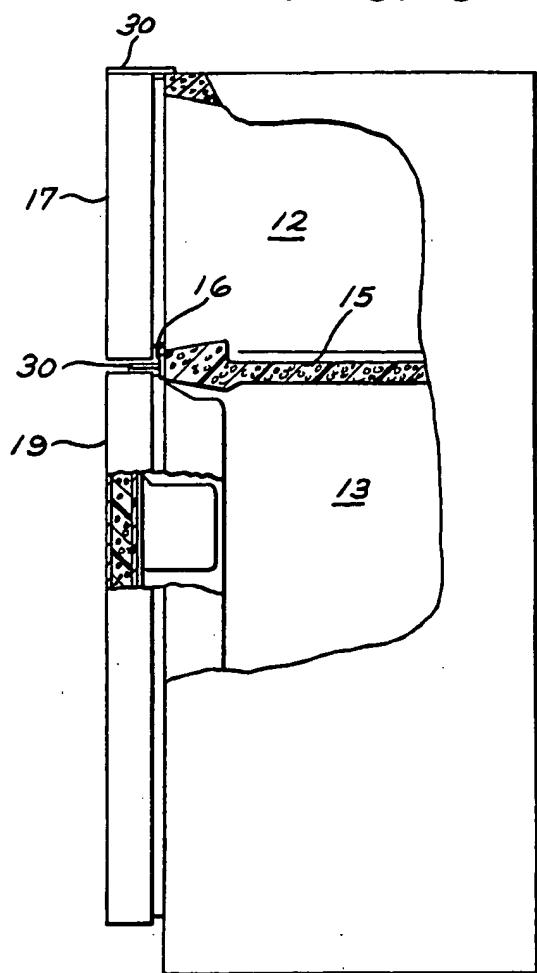
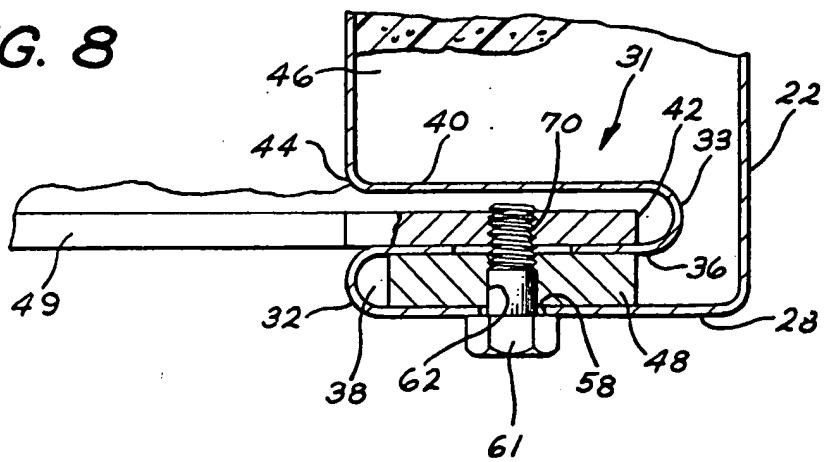


FIG. 8



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FIG. 3

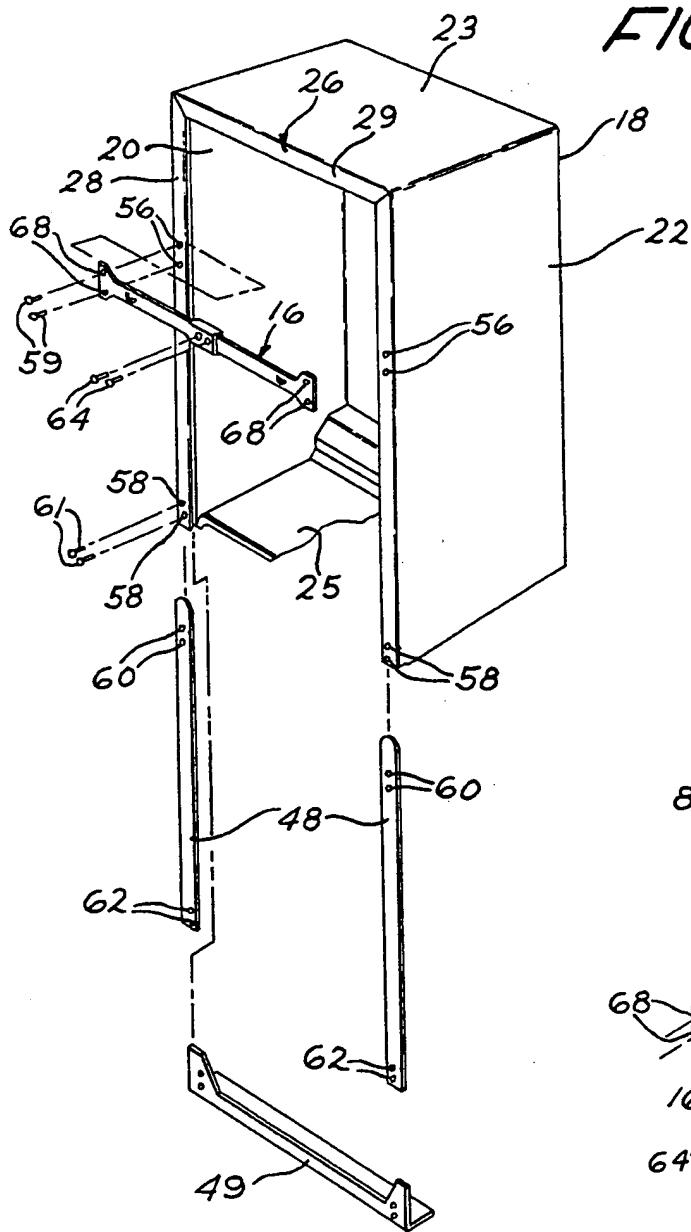
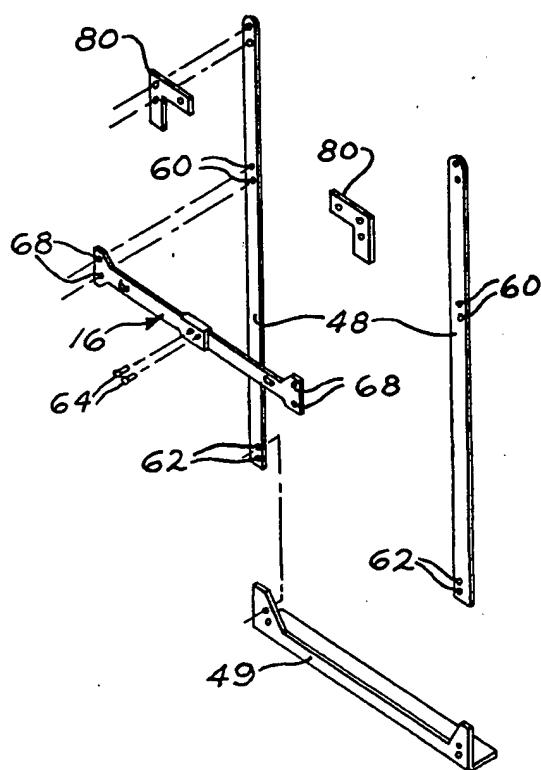


FIG. 4



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FIG. 6

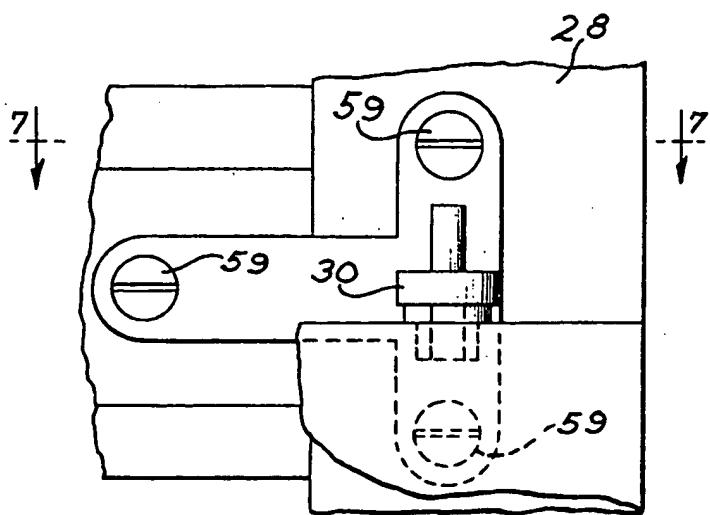


FIG. 5

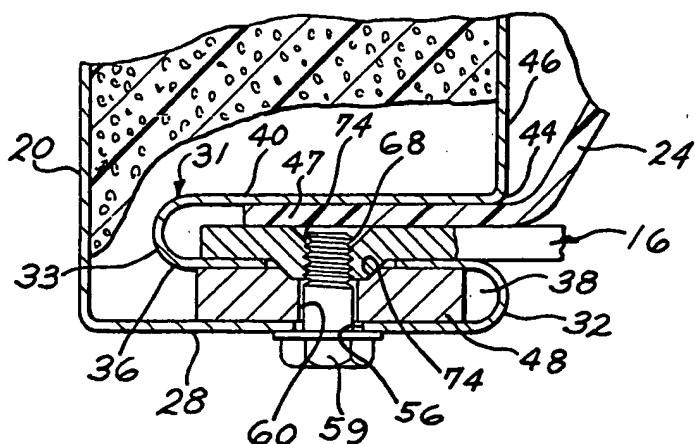
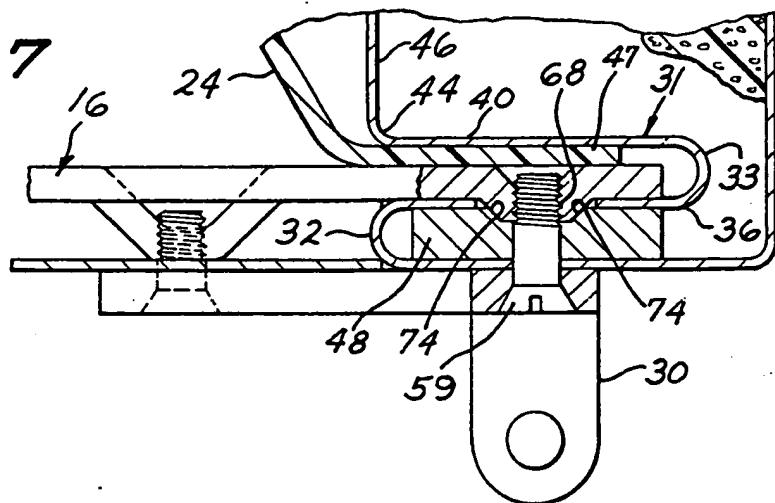


FIG. 7





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EUROPEAN PATENT APPLICATION

21 Application number: 86108354.1

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71 Applicant: GENERAL ELECTRIC COMPANY, 1 River Road, Schenectady New York 12305 (US)

43 Date of publication of application: 30.12.86
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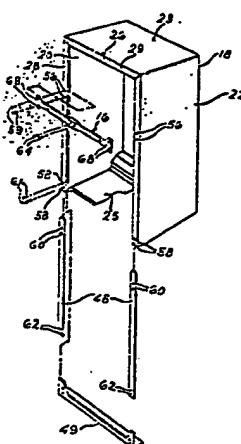
84 Designated Contracting States: DE FR GB IT

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54 Refrigerator cabinet and method of assembly.

57 A refrigerator cabinet (10) having an outer metal case (18) including side walls (20, 22) and a top wall (23), a plastic inner liner (24) and a partition (15) separating a freezer and fresh food compartments (12, 13) and separate front door openings. A front face (26) is formed along the front edge of the side walls (20, 22) and top wall (23) defining the door openings. The front face along each side wall (28) is provided with a first pair of vertically spaced openings (56) arranged in the area adjacent the partition (15) and a lower pair of vertically spaced openings (58) arranged in the lower end of the front face (26). A support frame system is provided including vertically extending side support bars (48), each having pairs of vertically spaced upper and lower openings (60, 62) dimensioned to align with the upper and lower openings (56, 58) in the front face. An upper cross member (16) extending between the side walls (20, 22) is positioned adjacent the front portion of the partition (15) and a lower cross member (49) extending between the lower edge portion of the side walls (20, 22). The upper and lower cross members (16, 49) include a pair of vertically spaced openings (68, 70) adjacent each end thereof which are cooperatively arranged relative to the upper and lower pair of vertically spaced openings (56, 58, 60, 62) in the front face (28) and support bar (48). Securing means (59) cooperating with the aligned upper and lower pairs of vertically spaced ope-

nings (56, 58, 60, 62, 68, 70) in the front face (28), support bar (48) and their respective cross members (16, 49) for securely holding the cross members (16, 49) substantially perpendicular relative to the cabinet side walls (20, 22) to thereby insure that the front door openings are maintained in a substantially square relationship.



EP 0 206 258 A3



EP 86 10 8354

DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
E	EP-A-0 206 257 (GENERAL ELECTRIC CO.) * Page 4, lines 1-7; page 6, line 4 - page 7, line 18; page 8, line 8 - page 9, line 28; page 11, lines 13-24; figures 1,3,7 * ---	1-3,6,7	F 25 D 23/06
A	US-A-4 170 391 (GENERAL ELECTRIC CO.) * Column 2, line 24 - column 4, line 5; figures 1-4 * ---	1,6	
A	GB-A-2 149 488 (K.K. TOSHIBA) * Page 1, lines 101-114; page 2, lines 4-15,28-43; figures 2-4 * ---	1-3,6,7	
A	GB-A- 622 086 (GENERAL MOTORS CO.) * Page 1, line 64 - page 2, line 5; figures 1-3 * ---	1,6	
A	GB-A-1 065 211 (ASSOCIATED ELECTRICAL IND.) * Page 2, line 86 - page 3, line 7; page 3, lines 39-110; figures 2,5,6 * ---	1,6	
A	FR-A-2 447 525 (FISHER & PAYKEL LTD) * Page 3, lines 5-13; figure 1 * ---	1,6	F 25 D
A	US-A-2 675 687 (PHILIPP) * Column 2, lines 29-50; column 3, line 50 - column 4, line 35; figures 3,8-12,15 * ---	1,6	
D, P A	US-A-4 558 503 (GENERAL ELECTRIC CO.) -----		
The present search report has been drawn up for all claims			
Place of search	Date of completion of the search	Examiner	
THE HAGUE	12-04-1989	BELTZUNG F.C.	
CATEGORY OF CITED DOCUMENTS		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document			

